

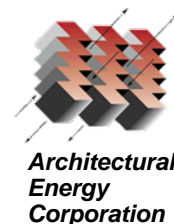
Agenda

- Scope and Application
- HERS Reports
- Energy Modeling
- Rating Recommendations
- What's Next

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Efficiency Committee Hearing
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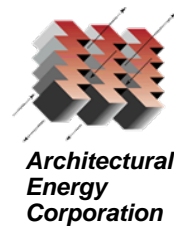
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HERS Regulations, Section 1672(a)



“A California Whole-House Home Energy Rating or a California Home Energy Audit shall be completed for a home only if it is completed as specified by these regulations and the HERS Technical Manual.”

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Approach



- **Rate the home not the occupants**
- **But, consider utility bills and life-style patterns when developing recommendations and estimating savings**

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California HERS Program Objectives



● Complete implementation of the HERS Program pursuant to Public Resources Code Section 25942

➤ Phase I:

- Adopted in 1999
- Established general framework
- Field verification and diagnostic testing

➤ Phase II:

- Expands program scope
- Includes the audit or rating of newly constructed and existing homes

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● Phase II fulfills the goals of Public Resources Code 25942 by:

- Guiding the production of consistent, accurate, and uniform ratings based on a single statewide rating scale
- Ensuring that any audit or rating include reasonable estimates of potential utility bill savings and reliable recommendations on cost-effective measures to improve energy efficiency
- Establishing labeling procedures that will meet the needs of home buyers, homeowners, renters, the real estate industry, and mortgage lenders with an interest in home energy ratings
- Proposing a technique for determining energy efficiency measure cost-effectiveness
- Proposing a technique to develop recommendations for energy efficiency improvements, including cross checking against utility bills

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Existing Home Opportunities in California



- **Over 13 million residential dwelling units**
- **Many were built before 1978 with limited energy efficiency measures**
- **Homes built after 1978 continue to have significant opportunities for energy efficiency improvements**
- **Highly cost-effective energy efficiency measures**
- **Consumer education**

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Distribution of California Residential Electricity Consumption



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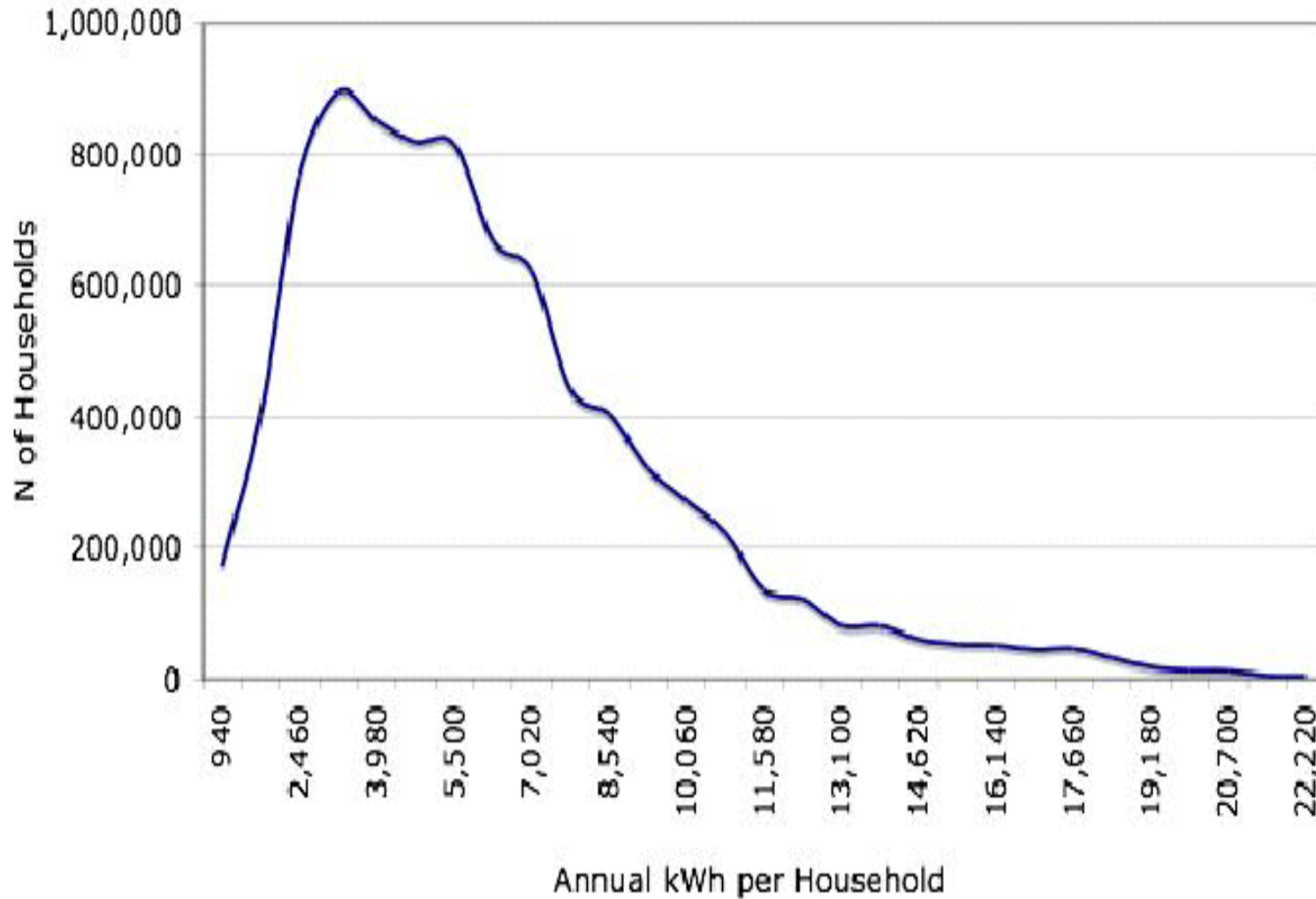
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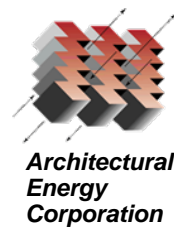


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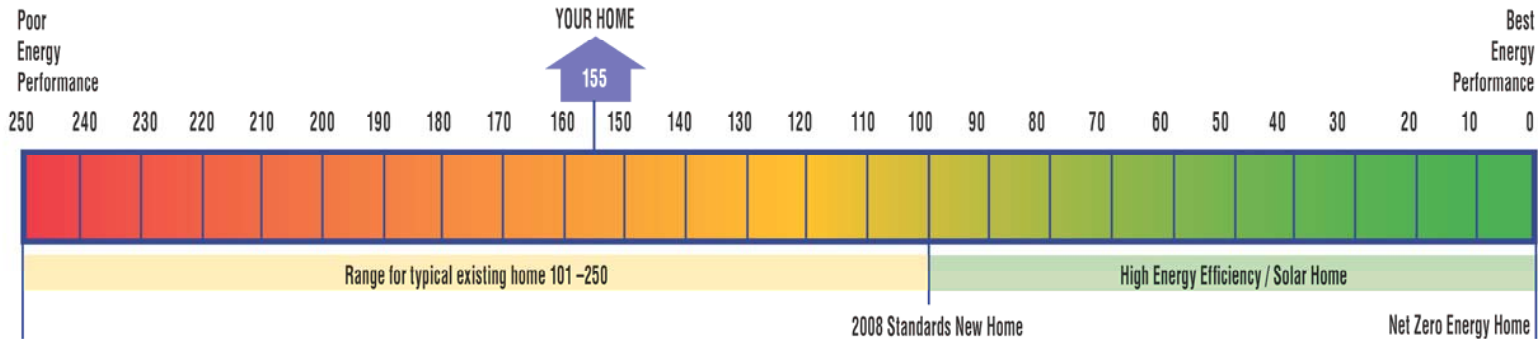
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Sample Rating Certificate



California Home Energy Rating Certificate



Information goes here on compliance with other programs:

Qualifying Information Goes Here:

HERS Provider and/or Sponsor Co-Branding Logos Go Here:

Energy Impact

Greenhouse Gas Emissions

Carbon Dioxide xxx tons/year

Energy Consumption

Electricity (kWh/year)

Cooling ---

Lights ---

Appliances ---

Total ---

Natural Gas (therms/year)

Space Heating ---

Water Heating ---

Total ---

Operating Cost (\$/year)

Electricity ---

Gas ---

Total ---

Renewable Energy Production

None

Site Information

Address

123 Jones Street
Anywhere, California 9410x

General Information

Conditioned Floor Area 2,200 ft²
Bedrooms 4
House Type Single Family
Foundation Type Slab-on-Grade

Energy Efficiency Features

Insulation

Ceiling R-30
Wall R-11
Floor over crawlspace None
Slab Edge None

Windows

Frame Aluminum
Glazing Double

Heating System

Gas furnace, 0.80 AFUE
Unsealed air distribution ducts

Cooling System

None

Water Heating System

Gas storage type, 0.52 EF

Official Home Energy Rating

in conformance with the requirements of the California Energy Commission
www.energy.ca.gov



HERS Provider:

Acme Energy Rated Homes
934 Energy Efficient Way
Power Junction, California
www.AcmeEnergyRatedHomes.com

Rating Information

Rating Number xxxx-yyyy
Certified Rater EEH, Inc.
Stockton, CA
Rating Date: January dd, yyyy

Rater Signature

Date

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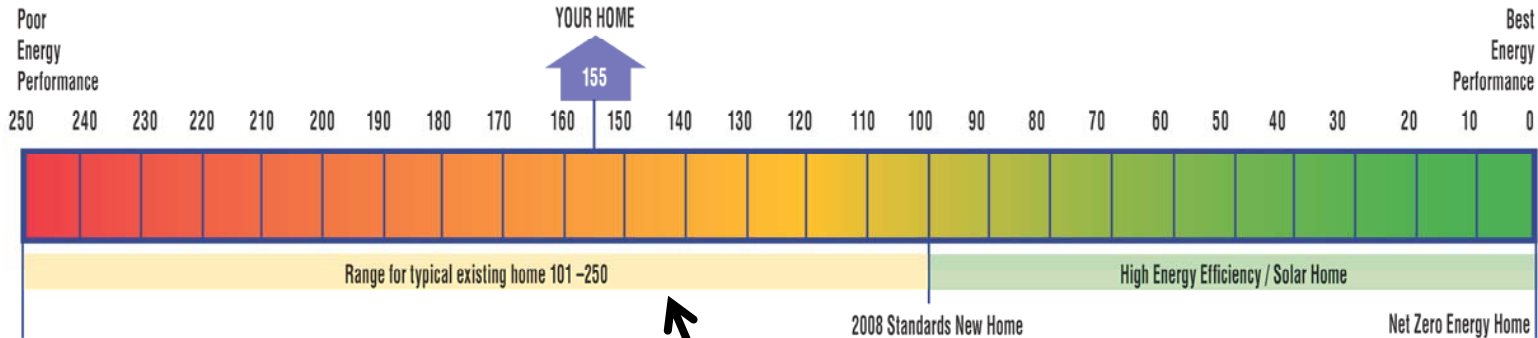
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California HERS Index



California Home Energy Rating Certificate



Information goes here on compliance with other programs:	Energy Impact	Site Information	Official Home Energy Rating
	Greenhouse Gas Emissions Carbon Dioxide xxx tons/year	Address 123 Jones Street	in conformance with the requirements of the California Energy Commission
	Energy Consumption Electricity (kWh/year) Cooling --- Lights --- Appliances --- Total --- Natural Gas (therms/year) Space Heating --- Water Heating --- Total ---	General Information Conditioned Space (sq ft) Bedrooms House Type Foundation Type Slab-on-Grade	
	Operating Cost (\$/year) Electricity --- Gas --- Total --- Renewable Energy Production None	Energy Efficiency Insulation Ceiling R-11 Wall R-11 Floor over crawlspace Sub Floor None Windows Frame Aluminum Glazing Double Heating System Gas furnace, Unsealed air distribution ducts Cooling System None Water Heating Gas storage type, 0.52 EF	HERS Provider: Acme Energy Rated Homes 934 Energy Efficient Way Power Junction, California Rating Date: January dd, yyyy
Qualifying Information Goes Here:			
HERS Provider and/or Sponsor Co-Branding Logos Go Here:			

HERS Index is ratio of the TDV energy of the rated house to the TDV energy of a reference house

Zero represents a zero energy home

100 represents the reference home (minimum compliance with the 2008 California energy efficiency standards)

Most older homes will have an index greater than 100

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● Energy Uses Included in the Rating

- Traditional uses of heating, cooling, and water heating are already produced by compliance software
- Lighting and appliances energy as determined through the recommended model
- Exterior lighting attached to the building

● Energy Uses Included in Recommendations but not in the Rating

- Pools
- Spas
- Lighted sports courts
- Well pumps

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On-site Renewable Generation



- **Two ratings are required:**
 - **One rating for the building's energy efficiency features**
 - **One rating for those features plus on-site renewable generation (e.g., photovoltaics)**
- **The California Energy Commission in its 2007 Integrated Energy Policy Report recommends a goal of achieving zero-energy newly constructed homes by 2020**
- **It is critically important to invest first in energy efficiency**
- **Calculations of PV production shall be determined on an hourly basis using the CECPV calculator described in the 2008 Residential ACM Approval Manual, Appendix B**

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The Standard and Custom Approaches



- The HERS system shall have the capability to generate recommendations using both a **Standard Approach** and a **Custom Approach**
- Approved HERS systems shall be able to accommodate both approaches. However, the Standard Approach is mandatory for every rating and the Custom Approach is optional
- The Standard Approach is intended to result in the same set of recommendations, no matter who does the rating or which HERS system is used
- The Custom Approach allows for consideration of unique homeowner circumstances, such as operating practices; safety, comfort, noise, moisture, or code-compliance problems; and available financing

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The California Home Energy Rating Process



1. Inspection of the existing conditions of the home's energy-related features
2. Analysis of the energy impact of those features
3. Identification of potential energy efficiency improvements for that home
4. Evaluation of the cost effectiveness of each improvement
5. Recommendations to the homeowner of the cost effective improvements
6. Designation of a rating of the comparative energy efficiency of the home
7. Production of a label that communicates the rating

Energy Audit

Whole-House Home Energy Rating

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Sample Home Energy Audit Certificate



California Home Energy Audit Certificate

Energy Impact	
Greenhouse Gas Emissions	
Carbon Dioxide tons/year	xxx
Energy Consumption	
Electricity (kWh/year)	
Cooling	—
Lights	—
Appliances	—
Total	—
Natural Gas (therms/year)	
Space Heating	—
Water Heating	—
Total	—
Operating Cost (\$/year)	
Electricity	---
Gas	---
Total	---
Renewable Energy Production	
None	



Official Home Energy Audit
in conformance with the
requirements of the
California Energy Commission
www.energy.ca.gov

Site Information

Address

123 Jones Street
Anywhere, California 9410x

General Information

Conditioned Floor Area 2,200 ft²
Conditioned Volume 16,000 ft³
Bedrooms 4
House Type Single Family
Foundation Type Slab-on-Grade

Energy Efficiency Features

Insulation

Ceiling R-38
Wall R-19
Floor over crawlspace R-19
Slab Edge R-7

Windows

Frame Alum. Clad Wood
Glazing Double low-e

Heating System

Condensing gas furnace, 0.92 AFUE
Sealed air distribution ducts

Cooling System

None

Ventilation System

None

Water Heating System

Gas storage type, 0.62 EF
ICS solar system

Energy Auditor Signature _____

Date: _____

Information
goes here on
compliance
with other
programs

HERS Provider
and/or Sponsor
Co-Branding
Logos Go Here

Qualifying
Information
Goes Here

HERS Provider
Acme Energy Rated Homes
834 Energy Efficient Way
Power Junction, California
www.AcmeEnergyRatedHomes.com

Rating Information

Rating Number xxx-yyy
Certified Rater EEH, Inc.
Stockton, CA
Rating Date January dd, yyyy

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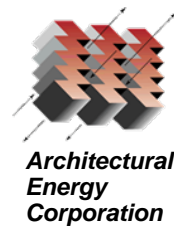


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Recommended California HERS Index



$$\text{HERS Index} = \frac{\text{TDV}_{\text{Rated}} - \text{TDV}_{\text{PV}}}{\text{TDV}_{\text{Reference}}} \times 100$$

- **TDV_{Rated}** = Time Dependent Valued (TDV) Energy Use of the Rated Home
- **TDV_{PV}** = TDV Energy Production of the On-Site Renewable Generation
- **TDV_{Reference}** = TDV Energy Use of the Reference Home

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Adjustments for House Size



- **If the conditioned floor area of the rated home is larger than 2,500 ft², the TDV energy of the reference home shall be based on a 2,500 ft² home**
 - **Growing concern with the unnecessary energy consumption resulting from large homes**
 - **LEED for Homes recognizes home size in setting targets and penalizes homes larger than 2,600 ft² (four bedrooms)**
 - **2,500 square feet is one standard deviation (780 ft²) above the average size single family home in the state (1,780 ft²) according to the RASS 2004 dataset**
 - **Local ordinances for newly constructed homes have established caps for homes of 3,500 ft²**

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Greenhouse Gas Emissions Associated with Energy Consumption



- **Emissions shall be calculated hourly based on estimates of electricity and gas consumption**
- **Emission rates shall be taken from the Time Dependent Valued (TDV) hourly files used for the Building Energy Efficiency Standards**

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ACM Modeling Rules



The modeling rules and assumptions specified in Chapter 3 of the 2008 Residential Alternative Calculation Method (ACM) Approval Manual shall be used to calculate the TDV Energy for the rated home and the reference home, except as otherwise stated in the HERS Technical Manual

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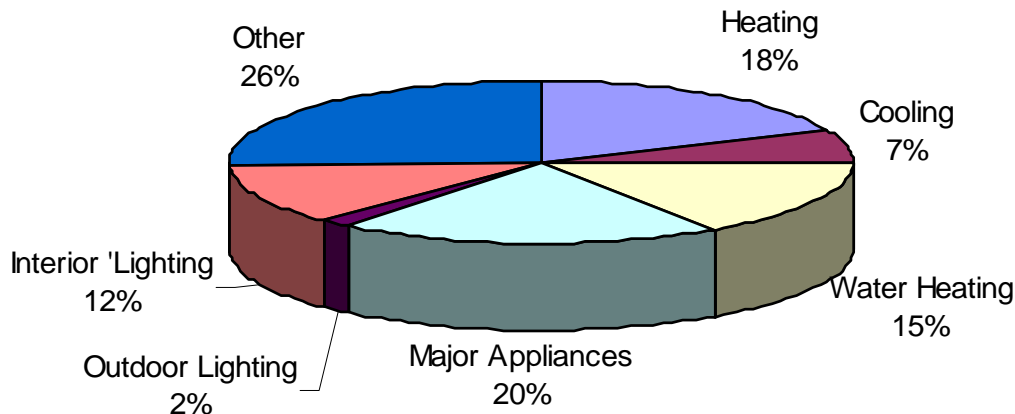
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Lighting and Appliance Energy



- **California Standards compliance calculations include only space heating, cooling and water heating energy**
- **Lighting and other appliance energy use is regulated through mandatory requirements, but not included in the performance standard.**
- **For HERS ratings, lighting and appliance energy shall be included**



Average Single Family Source Energy Use

Note: These data represent average source energy use for existing homes in California, many of which are near the coast with low cooling loads.

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Equipment Energy Use



- **Most plug in equipment moves with the occupants: TVs, home theater equipment, computers, stereos, water beds, clothes washers, and dryers**
- **HERS Equipment Energy use is estimated based on RASS 2004 survey of existing homes**
- **Reference home refrigerator, dishwasher, and range/oven based on current Appliance Standards**
- **Rated home refrigerator based on RASS 2004 if efficiency cannot be determined**
- **Location and type of equipment determines if energy use contributes to internal load for heating and cooling**

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- **Most plug-in lamps move with the occupants**
- **Lighting energy use is based on RASS 2004 estimate**
- **Operating hours is a function of room type - Lights in kitchens are on more hours than bedrooms**
- **Reference home assumes compliance with 2008 Building Energy Efficiency Standards requirements for hardwired fixtures with high efficacy lighting for some rooms and incandescent with specific controls in other rooms**
- **Rated home accounts for number of high efficacy hardwired fixtures and controls**

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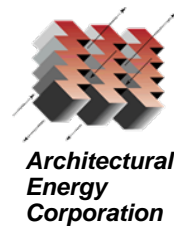
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Background on Rating Recommendations



The Public Resources Code (§25942) specifies that statewide home energy rating programs shall include “reasonable estimates of potential utility bill savings and reliable recommendations on cost effective measures to improve energy efficiency”

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Rolling Basecase Method-Standard Approach



- **Measures shall be evaluated in the following groups:**
 1. **Building Envelope**
 2. **Distribution System and Equipment Tuning**
 3. **Appliances and Lighting**
 4. **HVAC and Water Heating Equipment Replacement**
- **Evaluate all possible measures in the group and rank measures in terms of benefit-to-cost ratio (first year energy savings divided by additional annual mortgage payment)**
- **Add the top measure to the home and repeat the process until the next measure increases the after-tax cash flow above the original basecase**
- **Evaluate measures in the next group using the same process**

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Standard Approach

The list of recommendations shall include all measures that are cost effective, considering the interactions between the measures

Custom Approach

The Custom Approach may use any of the following methods:

- ***Fixed Budget.*** Achieve the greatest energy savings for a given cost
- ***Minimum Level of Performance.*** Bring the house up to some specified level of energy performance at the least cost
- ***Customer Specific Measures.*** Allow for unique homeowner preferences or circumstances such as safety, moisture, or code-compliance problems

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Determining Cost Effectiveness of Energy Efficiency Measures



Standard Approach

Determine cost effectiveness of measures using an after-tax cash flow method with a 30-year fixed-rate mortgage based on rate published by Freddie Mac. Use 30 percent combined Federal and State marginal tax rate.

Custom Approach

Consider cost-effectiveness from the perspective of the homeowner or investor, including: mortgages or other financing programs

Each homeowner's individual tax bracket and mortgage rate may be considered

Non-energy benefits (such as thermal comfort, indoor air quality, and acoustics) may also be considered in making recommendations

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Standard and Custom Approaches

Use the utility rates in effect for each home that is rated or the most common rate for the area if the utility account is not active

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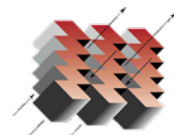


Public Comment

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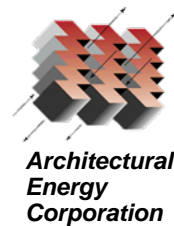


**Architectural
Energy
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Estimated Schedule for HERS Regulations



- **Committee Hearing on Proposed Regulations (45-Day Language)**
 - **October 15, 2008**
- **Request additional written comments no later than**
 - **October 24, 2008**
- **15-Day Language Intent or Possible Adoption date if no 15-Day Language**
 - **November 19, 2008**
- **Anticipated Commission Adoption of 15-Day Language**
 - **December 17, 2008 (This will be separately noticed)**
- **Anticipated Regulations Effective Date**
 - **July 1, 2009**

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